Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A micro-electro-mechanical system (MEMS) mirror device, comprising:

a mirror comprising a length greater than 4000 and less than 5500 microns, and a thickness greater than 240 microns;

beams connected to the mirror, wherein each beam extends from a respective proximal end at the mirror to a respective distal end spaced from the mirror, and each beam ~~comprising~~ comprises a plurality of respective rotational comb teeth;

bonding pads; and

springs connected between the beams and the bonding pads, wherein each beam is connected by multiple springs along a rotational axis of the mirror to ~~the~~ respective bonding pads, and at least one spring is located between another spring and the mirror.

2. (Original) The device of claim 1, wherein each beam comprises a width greater than 800 and less than 1400 microns, a length greater than 3000 and less than 9000 microns, and a thickness greater than 120 and less than 240 microns.

3. (Original) The device of claim 1, wherein each rotational comb tooth comprises a base width greater than 8 and less than 14 microns, an end width greater than 4 and less than 10 microns, a length greater than 400 and less than 900 microns, a thickness greater than 120 and less than 240 microns, and a pitch greater than 30 and less than 50 microns.

4. (Original) The device of claim 1, wherein each spring comprises a width greater than 20 and less than 60 microns, a total length greater than 600 microns, and a thickness greater than 120 and less than 240 microns.

5. (Original) The device of claim 1, wherein the mirror includes a rib having horizontal crossbeams interconnected with vertical crossbeams, each crossbeam having a thickness greater than 450 and less than 550 microns.

6. (Currently amended) A micro-electro-mechanical system (MEMS) mirror device, comprising:

a mirror comprising a length greater than 4000 and less than 5500 microns, and a thickness greater than 240 microns;

beams connected to the mirror, each beam comprising a plurality of rotational comb teeth;

bonding pads; and

springs, wherein each beam is connected by multiple springs to the bonding pads and ~~The device of claim 1, wherein~~ some of the bonding pads are defined within the beams and connected to at least one spring.

7. (Original) The device of claim 6, wherein said some of the bonding pads each has a width and a height greater than 350 and less than 700 microns, and a thickness greater than 120 and less than 240 microns.

8. (Original) The device of claim 1, further comprising a first plurality of stationary comb teeth, wherein the first plurality of stationary comb teeth and the plurality of rotational comb teeth are interdigitated in-plane.

9. (Previously presented) The device of claim 8, wherein a space between each of the plurality of rotational comb teeth and each of the first plurality of stationary comb teeth is greater than 8 and less than 14 microns.

10. (Original) The device of claim 8, wherein each of the first plurality of stationary comb teeth comprises a base width greater than 8 and less than 14 microns, an end width greater than 4 and less than 10 microns, a length greater than 400 and less than 900 microns, a thickness greater than 120 and less than 240 microns, and a pitch greater than 30 and less than 50 microns.

11. (Original) The device of claim 8, wherein the plurality of rotational comb teeth is coupled to a first steady or oscillating voltage and the plurality of stationary comb teeth is coupled to a second steady or oscillating voltage.

12. (Original) The device of claim 8, further comprising a second plurality of stationary comb teeth and a third plurality of stationary comb teeth, wherein the second and the third pluralities of stationary comb teeth are out-of-plane interdigitated with the plurality of rotational comb teeth.

13. (Original) The device of claim 12, wherein each of the second plurality of stationary comb teeth comprises a base width greater than 8 and less than 14 microns, an end width greater than 4 and less than 10 microns, a length greater than 150 and less than 500 microns, a height greater than 250 and less than 450 microns, and a pitch greater than 30 and less than 50 microns.

14. (Original) The device of claim 13, wherein each of the third plurality of stationary comb teeth comprises a base width greater than 6 and less than 14 microns, an end width greater than 4 and less than 10 microns, a length greater than 150 and less than 500 microns, a height greater than 250 and less than 450 microns, and a pitch greater than 30 and less than 50 microns.

15. (Original) The device of claim 14, wherein ends of the second plurality of stationary comb teeth are located greater than 500 and less than 700 microns from an axis of rotation, and ends of the third plurality of stationary comb teeth are located greater than 500 and less than 700 microns from the axis of rotation

16. (Original) The device of claim 11, wherein the second and the third pluralities of stationary comb teeth are coupled to a capacitance meter to sense a rotational angle of the mirror.

17. (Original) The device of claim 1, wherein a gap surrounding the mirror has a width greater than 150 and less than 350 microns.

18. (Original) The device of claim 17, wherein a pad around the mirror has a narrowest thickness greater than 400 microns from the gap surrounding the mirror.

19. (Original) The device of claim 1, comprising at least two beams, ten springs, and six bonding pads.

20. (Original) The device of claim 1, wherein the device is used in an application selected from the group consisting of laser printing, barcode scanning, and micro-display applications.

21. (Original) The device of claim 1, wherein the mirror includes a rib comprising a midsection and beams protruding from opposing sides of the midsection, the rib having a thickness greater than 450 and less than 550 microns.

22. (Currently amended) A micro-electro-mechanical system (MEMS) mirror device, comprising:

a bottom layer, comprising:

a rib;

a first plurality of stationary comb teeth;

a second plurality of stationary comb teeth;

anchoring pads;

a top layer, comprising:

a mirror having a bottom surface bonded to the rib, the mirror comprising a length greater than 4000 and less than 5500 microns, and a thickness greater than 120 microns;

beams connected to the mirror, wherein each beam extends from a respective proximal end at the mirror to a respective distal end spaced from the mirror, and each beam ~~comprising~~ comprises a plurality of rotational comb teeth;

bonding pads being bonded atop but electrically insulated from the anchoring pads;

springs connected between the beams and the bonding pads, wherein each beam is connected by ~~the~~ multiple springs along a rotational axis of the mirror to ~~the~~ respective bonding pads, and at least one spring is located between another spring and the mirror;

a third plurality of stationary comb teeth connected to one of the bonding pads;

wherein the first and the second pluralities of stationary comb teeth are out-of-plane interdigitated with the rotational comb teeth, and the third plurality of stationary comb teeth are in-plane interdigitated with the plurality of rotational comb teeth.

23. (Original) The device of claim 22, wherein each beam comprises a width greater than 800 and less than 1400 microns, a length greater than 3000 and less than 9000 microns, and a thickness greater than 120 and less than 240 microns.

24. (Original) The device of claim 22, wherein each rotational comb tooth comprises a base width greater than 8 and less than 14 microns, an end width greater than 4 and less than 10 microns, a length greater than 400 and less than 900 microns, a thickness greater than 120 and less than 240 microns, and a pitch greater than 30 and less than 50

25. (Previously presented) The device of claim 22, wherein each spring comprises a width greater than 20 and less than 60 microns, a total length greater than 600 microns, and a thickness greater than 120 and less than 240 microns.

26. (Original) The device of claim 22, wherein each crossbeam having a thickness greater than 450 and less than 550 microns.

27. (Currently amended) A micro-electro-mechanical system (MEMS) mirror device, comprising:

a bottom layer, comprising:

a rib;

a first plurality of stationary comb teeth;

a second plurality of stationary comb teeth;

anchoring pads;

a top layer, comprising:

a mirror having a bottom surface bonded to the rib, the mirror comprising a length greater than 4000 and less than 5500 microns, and a thickness greater than 120 microns;

beams connected to the mirror, each beam comprising a plurality of rotational comb teeth;

bonding pads being bonded atop but electrically insulated from the anchoring pads;

springs, wherein each beam is connected by the springs to the bonding pads and ~~The device of claim 22, wherein~~ some of the bonding pads are defined within the beams and connected to at least one spring;

a third plurality of stationary comb teeth connected to one of the bonding pads;

wherein the first and the second pluralities of stationary comb teeth are out-of-plane interdigitated with the rotational comb teeth, and the third plurality of stationary comb teeth are in-plane interdigitated with the plurality of rotational comb teeth.

28. (Original) The device of claim 27, wherein said some of the bonding pads each has a width and a height greater than 350 and less than 700 microns, and a thickness greater than 120 and less than 240 microns.

29. (Original) The device of claim 22, wherein each of the first plurality of stationary comb teeth comprises a base width greater than 8 and less than 14 microns, an end width greater than 4 and less than 10 microns, a length greater than 150 and less than 500 microns, a height greater than 250 and less than 450 microns, and a pitch greater than 30 and less than 50 microns.

30. (Original) The device of claim 29, wherein each of the second plurality of stationary comb teeth comprises a base width greater than 6 and less than 14 microns, an end width greater than 4 and less than 10 microns, a length greater than 150 and less than 500 microns, a height greater than 250 and less than 450 microns, and a pitch greater than 30 and less than 50 microns.

31. (Original) The device of claim 30, wherein ends of the second plurality of stationary comb teeth are located greater than 500 and less than 700 microns from an axis of rotation, and ends of the third plurality of stationary comb teeth are located greater than 500 and less than 700 microns from the axis of rotation

32. (Original) The device of claim 30, wherein each of the third plurality of stationary comb teeth comprises a base width greater than 8 and less than 14 microns, an end width greater than 4 and less than 10 microns, a length greater than 400 and less than 900 microns, a thickness greater than 120 and less than 240 microns, and a pitch greater than 30 and less than 50 microns.

33. (Original) The device of claim 22, wherein the plurality of rotational comb teeth is coupled to a first steady or oscillating voltage and the third plurality of stationary comb teeth is coupled to a second steady or oscillating voltage.

34. (Original) The device of claim 33, wherein the first and the second pluralities of stationary comb teeth are coupled to a capacitance meter to sense a rotational angle of the mirror.

35. (Original) The device of claim 22, wherein a gap surrounding the mirror has a width greater than 150 and less than 350 microns.

36. (Original) The device of claim 35, wherein said one bonding pad connected to the third plurality of stationary comb teeth has a narrowest thickness greater than 400 microns from the gap surrounding the mirror.

37. (Original) The device of claim 22, comprising at least two beams, ten springs, six bonding pads, and five anchoring pads.

38. (Previously presented) The device of claim 22, wherein a space between each of the plurality of rotational comb teeth and each of the third plurality of stationary comb teeth is greater than 8 and less than 14 microns.

39. (Original) The device of claim 22, wherein the device is used in an application selected from the group consisting of laser printing, barcode scanning, and micro-display applications.

40. (Original) The device of claim 22, wherein the rib comprises horizontal crossbeams interconnected with vertical crossbeams, each crossbeam having a thickness greater than 450 and less than 550 microns.

41. (Original) The device of claim 22, wherein the rib comprising a midsection and beams protruding from opposing sides of the midsection, the rib having a thickness greater than 450 and less than 550 microns.

42. (Previously presented) The device of claim 1, wherein the mirror comprises a width greater than 1000 and less than 1200 microns.

43. (Previously presented) The device of claim 22, wherein the mirror comprises a width greater than 1000 and less than 1200 microns.